Biodiversity and Extinction

I. Biodiversity – the richness and diversity of living species on Earth.

    A. Value of Biodiversity

        1. Instrumental Value – useful as a resource for humans (agriculture, medicine, recreation, science, aesthetics).

        2. Intrinsic Value – right to live because it exists, essential for function of biosphere.

Table 2 Approximate numbers of described species (in thousands) currently recognized and estimates of possible species richness for groups with more than 20 000 described species and/or estimated to include in excess of 100 000 species. The reliability of all estimates is likely to vary greatly. (After Hawksworth and Kalin-Arroyo 1995.)

	Described species	Number of estimated species		Working figure	Accuracy of working figure
		High	Low		
Viruses	4	1000	50	400	Very poor
Bacteria	4	3000	50	1000	Very poor
Fungi	72	2700	200	1500	Moderate
'Protozoa'	40	200	60	200	Very poor
'Algae'	40	1000	150	400	Very poor
Plants	270	500	300	320	Good
Nematodes	25	1000	100	400	Poor
Arthropodsi					
Crustaceans	40	200	75	150	Moderate
Arachnids	75	1000	300	750	Moderate
Insects	950	100 000	2000	8000	Moderate
Molluscs	70	200	100	200	Moderate
Chordates	45	55	50	50	Good
[Others	115	800	200	250	Moderate]
Totals	1750	111 655	3635	13 620	Very poor

Biodiversity "Hotspots"

Conservation International
February 2005

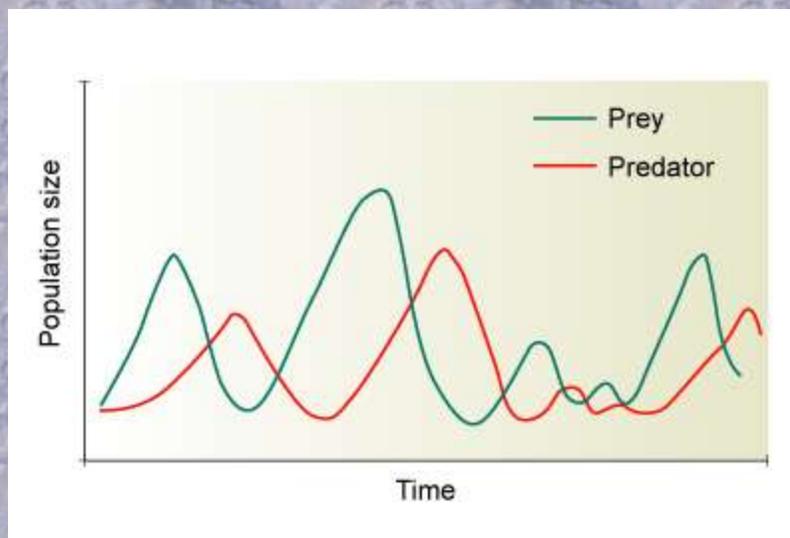Rarity-Weighted Richness Index

Low

High
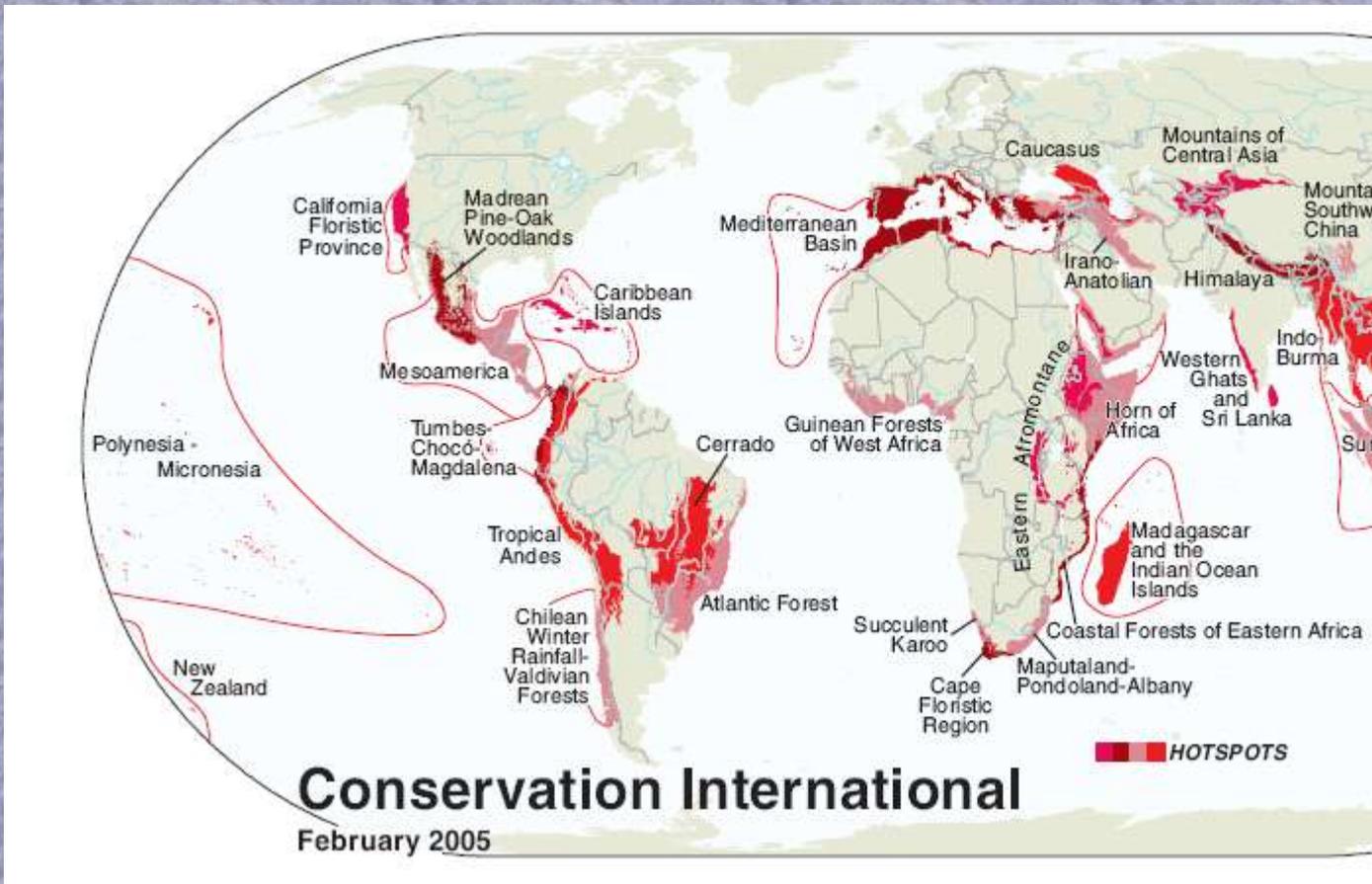
B. Wildlife Population Dynamics ~

1   Habitat Requirements – food, water, cover, and space.

                    Specialist vs. Generalist

2.   Predator/Prey Relationships – populations of prey affect populations of predators.

4.   Positive Feedback Loop – a runaway cycle in which a change in a certain direction causes a change further in that direction. Example: human population growth.

5. <u>Negative Feedback Loop</u> – a change in one direction causes a change in the opposite direction, or a lessening in the change. Example increased predators lead to a decrease in prey.

6. <u>K - Strategists</u> – species that produce few numbers of large offspring which need care for a long time. These organisms tend to maintain their population size near the carrying capacity. Examples include humans, mammals, sharks, birds of prey. Population usually fits an s-shaped growth curve:

7. <u>r - Strategists</u> – species that reproduce in high numbers often very quickly, and often experience a crash in population due to environmental resistance. Example include insects, algae, bacteria, fish, and rodent

| r Unstable environment, density independent	K Stable environment, density dependent interactions
small size of organism	large size of organism
energy used to make each individual is low	energy used to make each individual is high
many offspring are produced, each individual reproduces only once	few offspring are produced, individuals can reproduce more than once in their lifetime
early maturity, short life expectancy	late maturity, often after a prolonged period of parental care, long life expectancy
most of the individuals die within a short time but a few live much longer	most individuals live to near the maximum life span

C.   Extinction - the complete eradication of a species from the Earth.
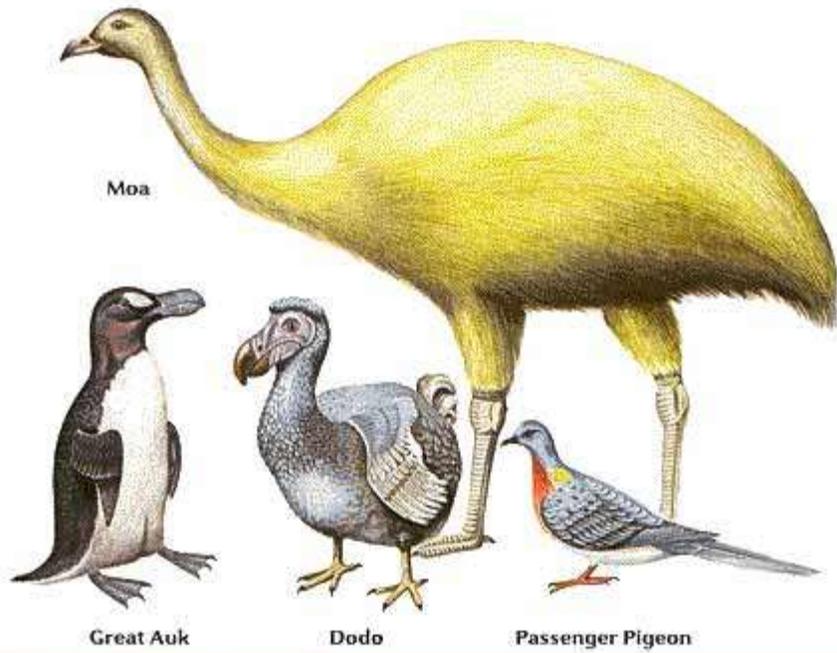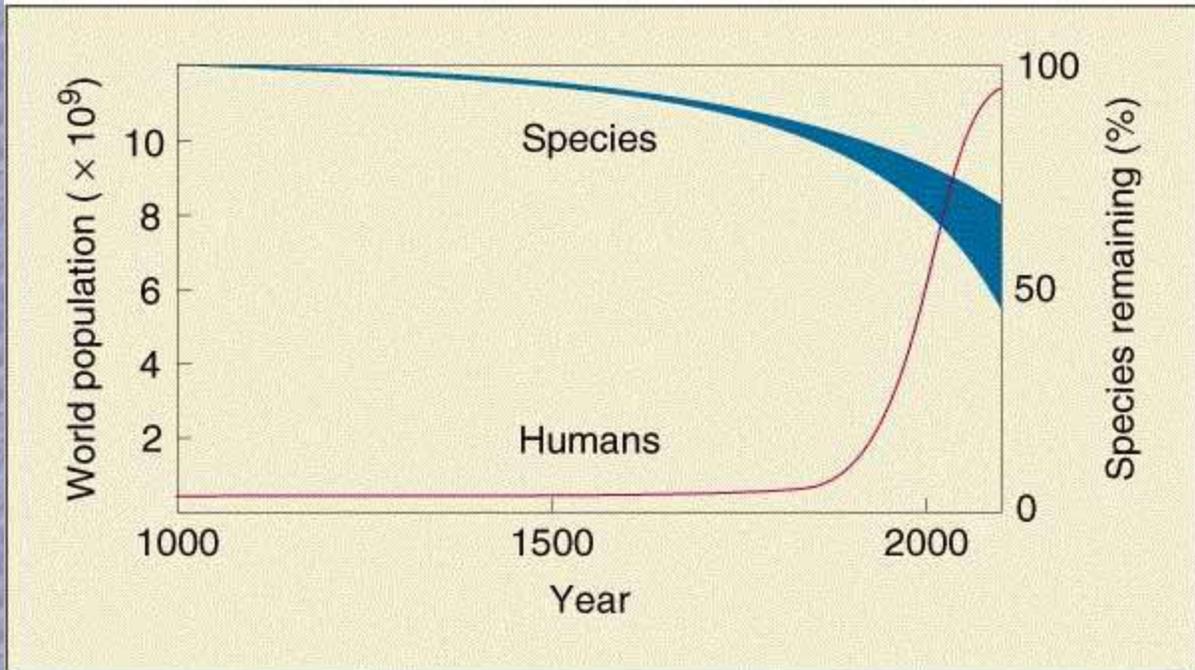
D.   Endangered or Threatened Species - species that are in danger of becoming   extinct. Endangered Species Act of 1973.
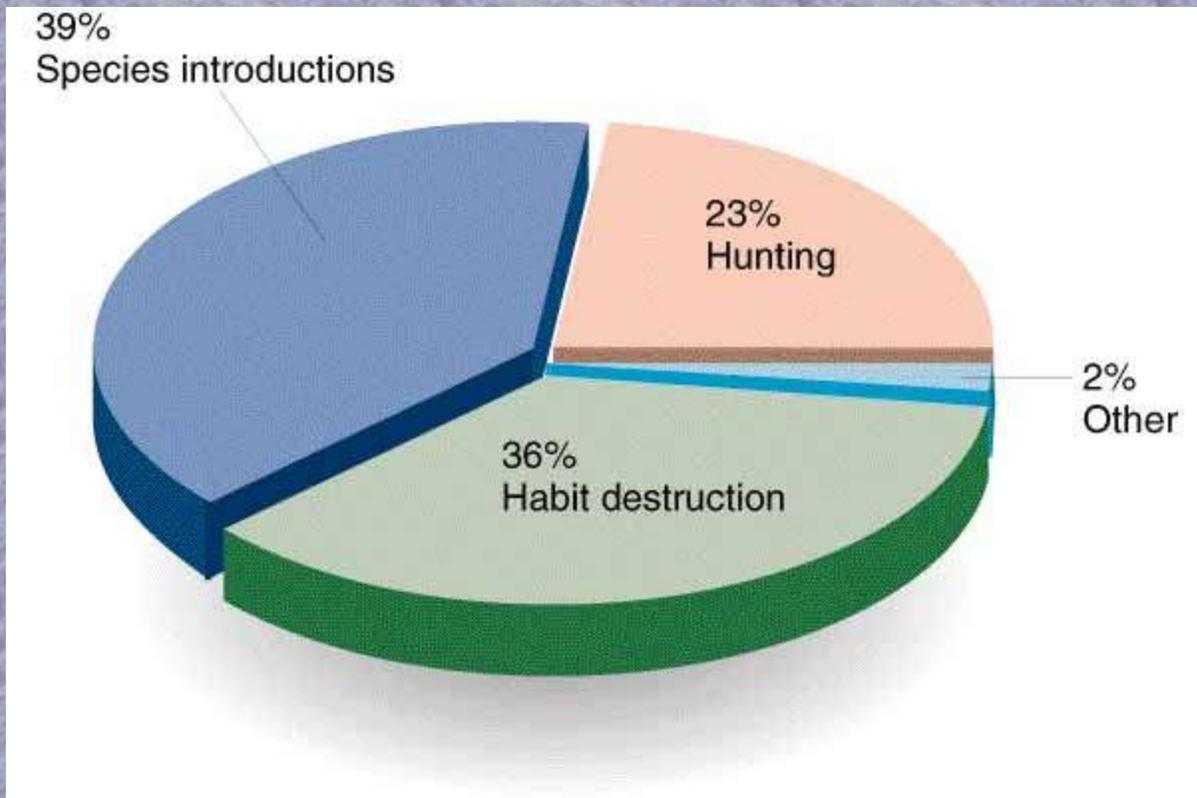
E.   Causes of Extinction -

1.   Habitat Destruction
2.   Commercial Hunting or Harvesting
3.   Exotic/Alien Species - species that are introduced to an area that do not naturally

reside there; therefore they have no environmental resistance to keep the population in check.
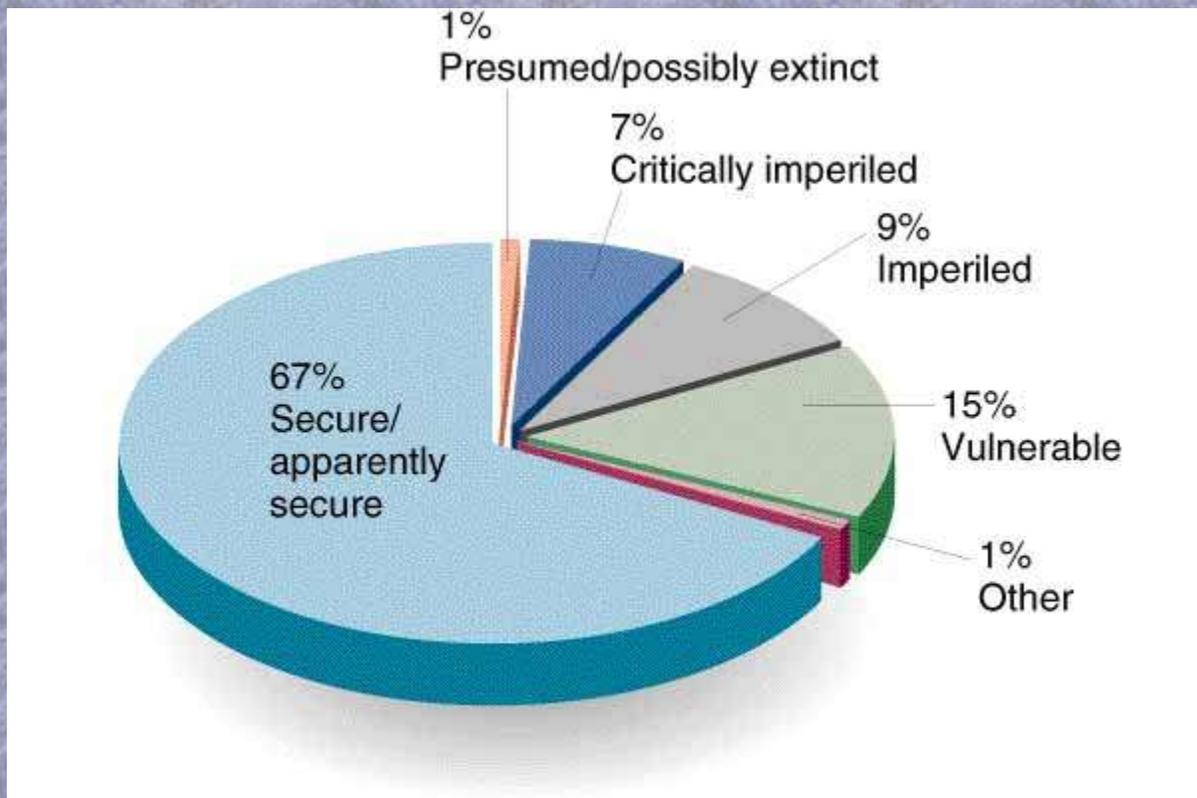
World Book illustrations by Venner Artists, Ltd.

Endangered or Threatened Species in New York

Status	Species listed in this state and that occur in this state
E	Bat, Indiana (*Myotis sodalis*)
E	Butterfly, Karner blue (*Lycaeides melissa samuelis*)
T	Eagle, bald lower 48 States (*Haliaeetus leucocephalus*)
T	Lynx, Canada lower 48 States DPS (*Lynx canadensis*)
E	Plover, piping Great Lakes watershed (*Charadrius melodus*)
T	Plover, piping except Great Lakes watershed (*Charadrius melodus*)
E	Puma (=cougar), eastern (*Puma (=Felis) concolor couguar*)
T	Sea turtle, green except where endangered (*Chelonia mydas*)
E	Sea turtle, hawksbill (*Eretmochelys imbricata*)
E	Sea turtle, Kemp's ridley (*Lepidochelys kempii*)

E	Sea turtle, leatherback (*Dermochelys coriacea*)
T	Sea turtle, loggerhead (*Caretta caretta*)
T	Snail, Chittenango ovate amber (*Succinea chittenangoensis*)
E	Sturgeon, shortnose (*Acipenser brevirostrum*)
E	Tern, roseate northeast U.S. nesting pop. (*Sterna dougallii dougallii*)
T	Turtle, bog (=Muhlenberg) northern (*Clemmys muhlenbergii*)
E	Wedgemussel, dwarf (*Alasmidonta heterodon*)
E	Whale, finback (*Balaenoptera physalus*)
E	Whale, humpback (*Megaptera novaeangliae*)
E	Whale, right (*Balaena glacialis (incl. australis)*)

Status	Species listed in this state that do not occur in this state
E	Beetle, American burying (*Nicrophorus americanus*)
E	Curlew, Eskimo (*Numenius borealis*)
T	Tiger beetle, northeastern beach (*Cicindela dorsalis dorsalis*)
E	Wolf, gray lower 48 States, except MN and where XN; Mexico (*Canis lupus*)

Plants -- 10 listings

- 5 occurring in New York
- 5 not occurring in New York
- 1 species listed in some other state occurring in New York

Status	Species listed in this state and that occur in this state
T	Amaranth, seabeach (*Amaranthus pumilus*)
T	Fern, American hart's-tongue (*Asplenium scolopendrium var. americanum*)
E	Gerardia, sandplain (*Agalinis acuta*)
T	Monkshood, northern wild (*Aconitum noveboracense*)
T	Roseroot, Leedy's (*Sedum integrifolium ssp. leedyi*)

Status **Species listed in this state that do not occur in this state**

E Bulrush, Northeastern (*Scirpus ancistrochaetus*)

E Chaffseed, American (*Schwalbea americana*)

T Orchid, eastern prairie fringed (*Platanthera leucophaea*)

T Pink, swamp (*Helonias bullata*)

T Pogonia, small whorled (*Isotria medeoloides*)

Status **Listed species occurring in this state that are not listed in this state**

T Goldenrod, Houghton's (*Solidago houghtonii*)

Number of exotic species in US

Plants	3723
Terrestrial vertebrates	142 + 51 within US
Insects and arachnids	>2000
Fishes	75 + 203 within US
Mollusks (nonmarine)	91
Plant pathogens	239
TOTAL	>6271

1/7/2002   45

Kudzu Vine (Japan)
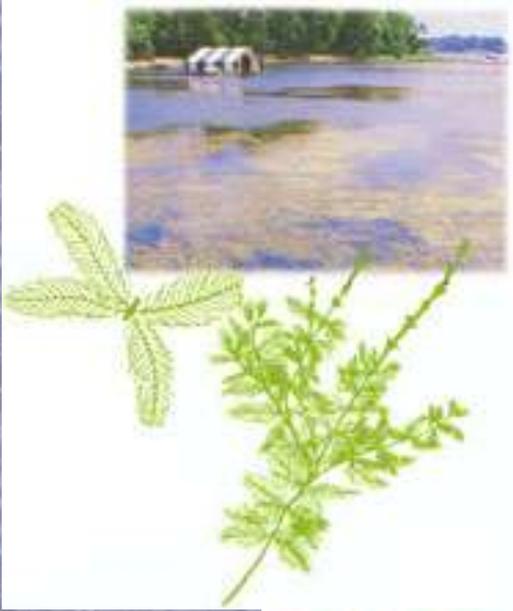
F.   "The Tragedy of the Commons" – a
      concept which describes the destruction
      of public resources as a result of their over
      use. This is often the result of the lack of
      ownership.

G. Methods to Prevent Extinction

1.   Zoo Approach – preserve species in captivity.

2.   Species Approach – manage specific target species.

3.   Ecosystem Approach – preserving or restoring ecosystems to save
many species.

H.   Wildlife Management – wildlife is any free living organism that has value to
humans. Wildlife management is the planned use, protection and control of
wildlife.

1. Habitat Improvement
Ecotone – A specific area where two ecosystems meet. These tend
to support high biodiversity, also known as the
"edge effect"

2. Wildlife Refuges and Wilderness Areas

Ecological Islands – isolated undisturbed wilderness containing only native species surrounded by disturbed land.

3. Controlled Hunting

3.   Fisheries Management – encourages the growth of populations of aquatic wildlife.

-Regulating harvest seasons, setting size and catch limits, restocking programs, protection of breeding grounds, pollution control.